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No. III.

DRAINING PLOUGH.

The LARGE SILVER MEDAL and FIFTEEN POUNDS were voted to Mr. JOHN PEARSON, of Frittenden, near Cranbrook, Kent, for his Draining Plough. The following Communication respecting it has been received from T. L. HODGES, Esq.; and a Model of the same has been placed in the Society's Repository.

Hemsted Place, Cranbrook, Kent,
SIR, March 24, 1829.

I BEG to send you, for the information of the Society, an account of the use and effect of the improved Draining Plough, invented by Mr. John Pearson, farmer, of Frittenden, near Cranbrook, in the county of Kent; together with a description of its component parts, and their sizes and proportions, illustrative of the model which I have the honour of presenting to the Society.

About six years since, Mr. Pearson hired a farm of nearly one hundred acres in the parish of Frittenden, which is situated in that district of the county called the Weald of Kent. The soil generally in that extensive district is very wet and stiff, having throughout, with very partial exceptions, a strong clay subsoil. Although it is so wet, there are very few springs. The water caused by rains and snow is held on the surface of the ground, owing to the retentive quality of the clay beneath, which hinders its sinking away. When no effectual efforts are made artificially to relieve this prevalence of moisture by

perforations of the clayey subsoil, all vegetation is extremely languid until an advanced period of the summer, when the power of the sun alone shall have been able to evaporate this undue portion of water; hence the corn is late before it begins to grow, and the crops are as scanty in amount as they are indifferent in sample. This powerful obstacle to all improvement in farming became fully apparent to Pearson after the first year's occupation; and he very justly considered, that unless he thoroughly underdrained every field of his farm, manure and tillage added only to his expenses, without any chance of profitable return. Having but a very limited capital,—to undertake the effectual drainage of his farm, according to the most approved method hitherto practised in that district, was not in his power. The cost of executing such work was from 6*d.* to 7*d.* per rod, or from 6*l.* to 7*l.* per acre,—a sum obviously too large, even if he possessed the capital, for tenants of such description of land, and under the present discouraging state of British agriculture, to adventure. Nevertheless, steadily and skilfully applying his mind to the discovery of some mode of cheapening the process of underdraining, after failing in many of his first experiments, he succeeded in forming the plough which is now submitted to the notice of the Society. His farm, having been entirely drained during the last five years by the plough, at present exhibits, as I myself have very recently witnessed, the most gratifying appearance. When this farm first came into Pearson's occupation, the produce of the wheat crops usually varied from two to three sacks per acre. Since it has been underdrained by the plough, his average has exceeded four quarters per acre, not unfrequently getting five quarters.

Pearson has had the experience of five years' success-

ful application of his draining plough before he ventured on the step of making known his discovery to the public. This invention consists in having applied to the common foot-plough a certain share, which he calls a horn share, together with certain other irons, as explained in the accompanying paper, by which he cuts out the drain to a sufficient depth, with an accuracy and celerity hitherto unattained, and gives a principle of duration and effect to the drain, when finished, equal to the best work of the same kind hitherto entirely performed, and at so great a cost, by hand labour; thereby accomplishing what has been so long and so much desired by all who are interested in improving wet and stiff soils, namely, a method of effectually and permanently draining such lands, and at a charge not exceeding one-sixth of the price which the best under-draining of such land has hitherto cost.

Pearson justly believed his invention to be well worth the expense of taking out a patent, which he might have disposed of with considerable advantage to himself; but it having been represented to him, that if his plough became a patent instrument, the cost of procuring it would become considerably enhanced to the farmer, besides the extra charge of carriage of it from London, or wherever the manufactory might happen to be; and, on the other hand, if no patent were taken out, it would soon be made by the wheelwrights and smiths in almost every parish, and thus get into general use;—influenced, therefore, by these considerations, Pearson has willingly consented to abandon all prospect of advantage to himself by taking out a patent, and prefers addressing himself to the liberality of the public for some compensation for his time, trouble, and ingenuity, to which they may consider him fairly entitled.

There is another and most important recommendation, that this discovery holds out the prospect of profitable employment for hand labour in parishes where wet, stiff soil prevails to an extent almost unlimited. This truly beneficial result has been most strikingly exhibited in the parish of Frittenden, where the inventor resides. The distressed condition of that parish was perhaps unequalled in that county, even so recently as two or three years ago. The poor-rates had mounted up to twenty-three shillings in the pound—almost all the labourers were thrown upon the poor-rate—and as the only residents in that parish besides the curate were merely farmers, for the most part tenants of small farms similar to Pearson's, a remedy for its distress seemed utterly hopeless. But the attention of the farmers being at length attracted by the unusual crops of all descriptions which Pearson's farm exhibited, an imitation of his system naturally followed, and the most beneficial effects upon the population of the parish have been the consequence; accordingly, since the draining plough has become generally used, they have no labourer out of employment, the rate of wages has risen, and the poor-rate has fallen from twenty-three to twelve shillings in the pound, and is still decreasing. The writer of this paper is entirely convinced that the adoption of this instrument throughout the district in which he resides will yield a benefit to every farmer equal to the whole amount of his annual poor-rate. By giving also, as is now done, to the labourers employed in this mode of draining, an increase of wages, in order to encourage them to execute their work carefully and expeditiously, the most gratifying improvement has followed in the condition, behaviour, and prospects of the workmen. In addition to these advantages, there exist the best grounds

for believing that the severe calamity to the grazing interests of the country, the rot in sheep, will be greatly mitigated, if not wholly got rid of, by the complete drainage of land, which this invention places, at so cheap a rate, in every one's power.

I am, Sir, &c. &c.

A. AIKIN, Esq.

Secretary, &c. &c.

THOMAS LAW HODGES.

Hemsted Place, Cranbrook,

SIR,

May 8, 1829.

I BEG leave, in reply to your letter of the 5th instant, to enclose a paper, drawn up by my steward, of the comparative expense of the old and the new (Pearson's) method of draining. I am also most happy in being able to inform you, that the most general desire possible is spreading throughout this district to adopt the plough, when the succeeding autumn shall bring the season best adapted to its use: not that any time of the year (except very dry weather or frost) is improper, but the months of October, November, and all the open part of the winter, are peculiarly suitable to its employment, from the following considerations:—The teams then have scarcely any work on which they can be employed—the labourers have then but little work—and the ground is soft and yielding. There is no doubt but that, if any person be under the necessity of hiring a team for the purpose of draining his land, the saving per rod of Pearson's mode over the old plan will be comparatively less in amount, but still so very much under it, as to render it, taking all its advantages together, every way preferable to the old method. I am far from saying or supposing that no

other plough may be invented that may not execute its work not only as well, but better than Pearson's; what I mean to assert is, that no draining plough hitherto made known to the public can stand for a moment in competition with Pearson's in its efficacy and economy when used on stiff, clayey soils.

I am, Sir, &c. &c.

A. AIKIN, Esq.

Secretary, &c. &c.

THOMAS LAW HODGES.

The usual mode of draining on the stiff clay soils in the wealds of Kent and Sussex has been to take out from three to four spits of earth with trenching tools, the depth varying from two to three feet; the bottom of the drain has then been filled in with wood, with straw or heath, with stone or draining tiles. The cost for labour only, on the above plan, has been, at two feet in depth, 4d.; two and a half feet, 5d.; and three feet, 6d. per rod. The wood and straw or heath, has increased the cost at least 2d. per rod, and stone or draining tiles much more. On an average, the draining done with wood or heath has not stood beyond six or seven years; when the material with which the drain was formed decayed, the work became useless.

By Pearson's method of draining, such is the regularity and precision with which the drain is cut by the plough (which is not to be attained by doing the work entirely by manual labour), that the expense of the above materials is entirely saved, by using the slide and ramming the clay on it, which, by forming a strong arch, renders the drain far more durable, as well as much less expensive, than the old mode. With regard to the expense

on Pearson's system, the manual labour will not exceed 1d. per rod at two feet in depth ; and if the mole share is used instead of taking out the bottom furrow, it will not amount to three farthings. In all wet districts similar to this, after the wheat sowing is completed, very little, if any thing, can be found to employ the teams about, and, generally speaking, they are standing idle from two to three months : unless a frost should intervene, this will be the most leisure, and in all respects the best part of the year for draining ; therefore, under these circumstances, it is not thought necessary to charge much for the work of the teams beyond the wages of the men and boys employed with them.

THOMAS NEVE.

*Description of the Model of Pearson's Improved
Draining Plough.*

[N.B. Model made on a reduced scale of two inches to the foot.]

Dimensions of the Wood-work.

Beam, $8\frac{1}{2}$ feet long ; fore end of ditto, $3\frac{1}{2}$ inches by 4 inches deep ; hind, 6 inches by $4\frac{1}{2}$ thick, having 6 inches spring in the middle.

Stump, 3 feet 5 inches long, and 5 by $4\frac{1}{2}$ inches thick.

Handles, 4 feet long, and 3 by 2 inches thick.

Sheath, 3 feet long, $5\frac{1}{2}$ inches wide, and $1\frac{1}{2}$ thick.

Chape, 4 feet long, 4 by 5 inches deep at fore end ; hind end, 4 by $4\frac{1}{2}$ inches deep.

The block, fixed on the fore side of the sheath down to the chape, 8 inches long from top of the chape to top of the block.

Wrist, 3 feet long by 4 inches wide.

Depth of plough at hind part, 18 inches ; at the fore part of ditto, $19\frac{1}{2}$ inches.

From the bottom of the chape to the top of the handles, 3 feet; from the fore side of the stump to the fore side of the sheath, 2 feet 2 inches wide.

From the fore side of the hind coulter to the fore side of the fore coulter, 9 inches.

[N.B. The letters *a*, *b*, *c*, &c. here made use of, refer both to the engraving and to similar ones affixed to the various parts of the models of the plough and the tools in the Society's repository.]

a, horn share; *b*, iron shoe to defend the end of the chape when the horn share is not used; *c*, wrist; *d*, spindle; *e*, side iron to assist in giving the earth an oblique direction; *f*, strap to strengthen the plough during the operations succeeding the horn share; *g*, foot; *h*, chape; *i*, hole in the chape, through which the mole iron passes up into the beam, where it is secured by the pin; *kk*, first pair of coulters, the thickest of which is screwed on the off side; *ll*, second pair of coulters, figs. 7 and 8, which cut the bottom of the drain,—each pair may be lengthened or shortened at pleasure, having two holes left for this purpose; *m*, fig. 4, narrow spade, four inches wide at the bottom, to take out the earth cut by the first pair of coulters; *n*, figs. 5 and 6, large scoop to clear after the spade, and accordingly made four inches broad; *o*, small scoop, figs. 9 and 10, to clear out the bottom cut by the second coulters; *p*, fig. 12, mole iron; *q*, fig. 11, slide made of yew-tree, $7\frac{1}{2}$ feet long, $2\frac{1}{2}$ inches high, and $1\frac{1}{2}$ thick at the upper surface. This, as nearly as possible, fits into the bottom of the drain. *r*, a portable windlass, which is placed across the drain to give regular advancing motion to the slide; *s*, the billet, which is long enough for the horses to draw clear of the drain. There is also a winch, fig. 13, to turn the nuts; and there ought always to be with the plough a common claw hammer.

Method of using the Plough and completing the Drain.

Four horses are fully sufficient for the first operation of taking out the furrow by the horn share, nine or ten inches deep by ten inches. The strap *f* is detached for this operation. The horn share, side iron, the wrist, and spindle, *e*, *c*, *d*, together with the foot *g*, as fig. 1, are all the pieces required for this operation. These figs. are all one-thirtieth part of the real size. The best plan is to continue the first day taking out this furrow, without altering the irons or bringing any labourers to assist. The distances between the drains must vary according to the degree of wetness and tenacity of the clay, and ought always to be drawn by a line, unless there previously exists an old furrow to serve as a guide for the ploughman; nine feet asunder is the distance commonly practised where this plough has been made use of. On the second day all these pieces are removed, and the first pair of coulters, *kk*, are then screwed on; also the iron shoe *b* on the end of the chape, and the strap *f* fixed on, as fig. 2. Fig. 3 shews these coulters in the furrow, the upper part of which has been made by the horn share, figs. 1 and 14. Here the team must be increased to eight horses, though six will do, but eight are found better. Immediately as the plough moves on, the labourers proceed to take out with the narrow spades *m*, fig. 4, the soil cut by the coulters. These are followed by others clearing the bottom with the large scoop *n*, figs. 5 and 6. When sufficient has been cut by the team to employ the men for that day's work, shift the first pair of coulters for the second pair, *ll*, figs. 7 and 8, and proceed as before in those furrows which have been scooped clean. The dotted lines at bottom of fig. 3 shew what these have to cut, and fig. 15 shews the end of the slide *q*, which is to be

dropped in. The men follow immediately and take out the clay, thus severed, with the small scoops *o*, figs. 9 and 10. The operations of taking out the earth after the coulters is often much facilitated by a boy running along with a watering-pot to moisten the furrows. The whole excavation is now completed about twenty-six inches deep, ten inches wide at the top, and tapering down to a curved bottom of about one inch. The slide *q*, fig. 11, is then dropped to the bottom of the drain; and it is right always to commence the operation from the lowest level of the drain, and to work it up hill. The windlass, fig. 11, is next placed at the full length of the rope, and the hook at the end of its iron chain (in the model it is brass) is applied to the lowest staple at the broad end of the slide. A man stands upon the frame of the windlass, and by his weight forces the four pegs firmly into the ground; he stands over the wheel ready to draw the slide regularly onwards according as another man lays in the clay which was taken out by the small scoops, and which is rammed down firmly upon the slide by a third man, who bestrides the drain, and rams the clay with a heavy rammer made to fit the shape of the drain, and having a stout wooden pin run through the upper part of it, so that he holds it with both hands. If the clay happens to be dry, a boy will occasionally pour a little water down before the rammer, and he can easily attend to two sets of fillers-in, who work parallel to each other. These three men occasionally take each other's work for their own relief; and those who are thus employed ought to be carefully selected and receive higher wages, in order to secure the utmost care, accuracy, and dispatch. The thickness of the clay, when thus rammed down, varies from three to four inches. As soon

as the man at the windlass has drawn the slide up to himself, he and the man filling in lift the windlass up together by one hand each, and walk with it forward to the end of the rope, and proceed as before. Other men then follow and fill in first the spits of earth taken out by the narrow spades, and which were laid evenly along the opposite side of the drain to where the horn share warp lies, and at the same distance from the drain, viz. ten inches; and, lastly, they lay the warp itself. All is then finished by a heavy roller going over it (if grass land) at any convenient time afterwards; but if the draining be made on arable land, the roller is unnecessary. Should the subsoil be uniformly clay, the mole iron *p*, fig. 12, may be substituted for the second pair of coulters, and drawn along the last cut of the drain by the team as before, thus saving the whole process of taking out the bottom cut, using the slide, filling in, ramming, &c.; cheapening the work one-half. In this case it is safer to have several main drains laid across the field to take these mole drains, so as not to trust the mole drains for too great a length; but the consistency and uniformity of the subsoil, together with the fall in the levels of the field, ought to determine this point. The main drains should be laid with draining tiles.

As the business of under-draining is best reserved for winter employment, it will be proper to commence at the close of the autumn; and as frosty or rainy weather is likely to occur, it is always right not to cut with the coulters more than you can take out and complete in the day. Two neighbours, joining teams of four horses each for this purpose, mutually assist each other; and it will require sixteen men to follow up the work cut out by the team, as three sets of fillers-in (each set

having its own slide, rammer, and windlass,) will be fully employed.

The cost of this plough, with the various irons belonging to it, is 9*l.* 5*s.*; and there will be necessary for the complement of men to follow up the team, so as to finish about two acres a-day, six of the narrow spades, three large scoops, four small ditto, three slides, three rammers, and three windlasses; amounting in all, including the cost of the plough, to about 18*l.*

THOMAS LAW HODGES.

No. IV.

FOREST TREES.

NOTE respecting Plantations of Forest Trees in the Neighbourhood of Liverpool; chiefly from information communicated by RICHARD YATES, Esq. of Liverpool.

THE country in the neighbourhood of Liverpool is naturally unfavourable to the growth of trees, the soil being, for the most part, dry, shallow, and sandy. It rests on beds of the new red sandstone, which, although not hard, is so compact as seldom to allow the roots of vegetables to penetrate it. Sometimes it is cracked, and then the roots of trees insinuating themselves, draw supplies at least of rain-water as it percolates through the rock. In many parts there intervenes between the rock and the soil a bed of brown sandy clay, containing rolled pebbles of granite, of limestone, &c., in its upper part excessively